Spin meeting minutes, 2/14/2007

Fanglei presented the comparison of simple analytical model with SPINK tracking for horizontal resonances. The analytical model assumes no spin coherence after each resonance and only utilizes a spin kick in front of the cold snake. In the spin tracking, two synthetic partial snakes (no orbit effect, only spin effect) were used. In general, the spin tracking shows the so-called spin coherence, which means the spin components after one horizontal resonance is affected by the resonances it passed. As the result, the spin tracking gives less polarization loss than the analytical model. To explore the difference between the two models, Fanglei did the spin tracking with the spin coherence removed. It was done in following way: she rematched spin through the energy ramp seven times. In addition, she used the so-called effective polarization (or the stable part of the polarization) defined as $P_{eff} = \langle \vec{S} \cdot \vec{n}_{co} \rangle$. Waldo asked if the stable spin direction is calculated from the stroboscopic average of all particles. Fanglei iterated the particle at a fixed energy for a few thousands turns, which is long enough comparing to synchrotron and betatron periods. With these changes, the polarization from the two models agreed very well. This implies that the horizontal resonances are dominated by the spin kick at the cold partial snake and the deviation from this simple model is likely due to the spin coherence. There is still question about the sudden drop of the polarization near $G\gamma = 18.5$, which requires further check. This result confirmed that the difference between the analytical model and realistic spin tracking is due to the spin coherence. There was a long discussion about how to present our results in the new paper. Mei suggested to do a tracking with real snake maps and vertical motion included. But this will change the scope of the paper and the real field maps of the partial snakes would introduce coupling, although Waldo and Alfredo pointed out there are ways to remove the coupling from the snake tracking matrices. In the end, the consensus is to use the current version of the plot, probably adding another curve for the tracking without rematching to show the effect. Thomas commented that the analytical model sums up all spin kicks at the cold snake coherently and should give the worst case scenario. In the spin tracking, the spin coherence can smooth this out and resulted high polarization. At the end of the meeting, Mei pointed out that the longitudinal phase space may not be preserved in the SPINK tracking. Since it is hard to eyeball from the plots, Fangeli will check the output longitudinal phase space.

Haixin